

CLAIMS

What is claimed is:

1. A process for treating exhaust gas, comprising:
exposing said gas to a plasma field; and
exposing said gas to a catalyst composition comprising $\text{MZr}_4(\text{PO}_4)_6$,
where M is a metal selected from the group consisting of platinum, palladium,
ruthenium, rhodium, osmium, silver, iridium, and alloys and combinations comprising
at least one of said foregoing metals.
2. The process of Claim 1, wherein said catalyst composition
further comprises 0.25 wt% to about 50 wt% of an oxidation catalyst, based upon a
total weight of said catalyst composition.
3. The process of Claim 2, wherein said oxidation catalyst is
selected from the group consisting of platinum, palladium, ruthenium, rhodium,
osmium, iridium, gold, copper, silver, titanium, aluminum, gallium, indium, tin, and
oxides, alloys, salts, and mixtures comprising at least one of said foregoing oxidation
catalysts.
4. The process of Claim 3, further comprising exposing said gas to
said $\text{MZr}_4(\text{PO}_4)_6$ prior to exposing it to said oxidation catalyst.
5. The process of Claim 4, wherein said oxidation catalyst is
disposed downstream from said plasma field.
6. The process of Claim 1, further comprising generating said
plasma field in a non-thermal plasma reactor.
7. The process of Claim 6, wherein said non-thermal plasma reactor
is a reactor selected from the group consisting of glow discharge reactor, RF discharge
reactor, pulsed corona reactor, dielectric-barrier discharge reactor, electrified packed
bed reactor, and surface discharge reactor.

8. The process of Claim 7, wherein said non-thermal plasma reactor is a pulsed corona reactor.

9. The process of Claim 1, wherein greater than or equal to about 66% of nitrogen oxides are removed.

10. The process of Claim 9, wherein greater than or equal to about 78% of nitrogen oxides are removed.

11. The process of Claim 10, wherein greater than or equal to about 90% of nitrogen oxides are removed.

12. The process of Claim 1, wherein said catalyst composition further comprises about 70 wt% to about 99 wt% of said $\text{MZr}_4(\text{PO}_4)_6$ and about 1 wt% to about 30 wt% of an oxidation catalyst, based on a total weight of said catalyst composition.

13. The process of Claim 12, wherein said catalyst composition further comprises about 80 wt% to 98 wt% $\text{MZr}_4(\text{PO}_4)_6$ and about 2 wt% to about 20 wt% of said oxidation catalyst, based on said total weight of said catalyst composition.

14. The process of Claim 1, further comprising exposing at least a portion of said gas to a catalytic converter.

15. The process of Claim 1, wherein said gas further comprises NO_x .

16. A gas treatment system, comprising:
a non-thermal plasma reactor; and
a catalyst composition disposed within said non-thermal plasma reactor, said catalyst composition comprising a $\text{MZr}_4(\text{PO}_4)_6$, wherein M is a metal selected from the group consisting of platinum, palladium, ruthenium, silver, rhodium, osmium, iridium, and combinations comprising at least one of said foregoing metals.

17. The gas treatment system of Claim 14, wherein said non-thermal plasma reactor is a reactor selected from the group consisting of glow discharge reactor, RF discharge reactor, pulsed corona reactor, dielectric-barrier discharge reactor, electrified packed bed reactor, and surface discharge reactor.

18. The gas treatment system of Claim 17, wherein said non-thermal plasma reactor is a pulsed corona reactor.

19. The gas treatment system of Claim 16, wherein said catalyst composition further comprises an oxidation catalyst.

20. The gas treatment system of Claim 19, wherein said oxidation catalyst is selected from the group consisting of platinum, palladium, ruthenium, rhodium, osmium, iridium, gold, copper, silver, titanium, aluminum, gallium, indium, tin, and oxides, alloys, salts, and mixtures comprising at least one of said foregoing oxidation catalysts.

21. The gas treatment system of Claim 16, wherein said catalyst composition comprises about 70 wt% to about 99 wt% of said $\text{MZr}_4(\text{PO}_4)_6$ and further comprises about 1 wt% to about 30 wt% of an oxidation catalyst, based on a total weight of said catalyst composition.

22. The gas treatment system of Claim 21, wherein said catalyst composition comprises about 80 wt% to 98 wt% of said $\text{MZr}_4(\text{PO}_4)_6$ and about 2 wt% to about 20 wt% of said oxidation catalyst, based on said total weight of said catalyst composition.

23. The gas treatment system of Claim 16, further comprising a catalytic converter in fluid communication with said non-thermal plasma reactor.

24. The gas treatment system of Claim 16, further comprising an oxidation catalyst in fluid communication with said non-thermal plasma reactor, wherein said oxidation catalyst is selected from the group consisting of platinum, palladium, ruthenium, rhodium, osmium, iridium, gold, copper, silver, titanium, aluminum, gallium, indium, tin, and oxides, alloys, salts, and mixtures comprising at least one of said foregoing oxidation catalysts.